

S/N 10/055,775  
Page 2 of 8

### **AMENDMENTS TO THE CLAIMS:**

A listing of the entire set of claims (including amendments to the claims) is submitted herewith. The listing of claims will replace all prior versions, and listing of claims in the Application.

1. (Currently Amended) A method for evaluating at least one metabolic pathway and culturing cells, the method comprising:

generating a symbolic model that represents a network comprising chemical reactions of the at least one metabolic pathway;

evaluating the symbolic model to identify a first set of precursor substrates and/or chemical reactions that are sufficient to produce a set of target end-products or a second set of precursor substrates and/or chemical reactions that are insufficient to produce the set of target end-products, wherein the symbolic model comprises a Boolean function that returns a predetermined value if the set of end-products target compounds is produced; and

culturing cells in a medium selected based upon identification of one of the first and second sets to selectively support viability of the cells.

2. (Canceled)

3. (Original) The method of claim 1 in which a plurality of sets that are sufficient are identified.

4. (Original) The method of claim 1 in which any arbitrary number of, up to and including all sets that are sufficient are identified.

5. (Previously Presented) The method of claim 1 further comprising, prior to the evaluating, reducing a number of elements in the model.

6. (Previously Presented) The method of claim 5 wherein said reducing comprises one

S/N 10/055,775  
Page 3 of 8

or more of the following:

Bootstrap elimination, impossible rule deletion, needed compound elimination, factoring by equivalences, simplifying left hand side/right hand side (LHS/RHS) overlaps, LHS subsumption, useless compound elimination, and reaction combination.

7. (Canceled)

8. (Previously Presented) The method of claim 1 further comprising expressing the Boolean function in if-then-else normal form.

9. (Original) The method of claim 8 further comprising mapping each if-then-else expression of the set to a diagram of nodes, wherein each node of the diagram maps to an expression of the set of if-then-else expressions, depends on a Boolean variable associated with the expression and is directionally connected to two lower nodes in accordance with relationships implied by the expression, wherein each of the two lower nodes is either a node that maps to another expression of the set or a terminal node, and wherein the evaluating comprises identifying a path from a node of the diagram that is not a lower node of any other node to one of the terminal nodes of the diagram.

10. (Original) The method of claim 9 wherein the path is a least-cost path.

11. (Original) The method of claim 1 in which the network comprises at least 100 chemical reactions.

12. (Currently Amended) A method for evaluating at least one metabolic pathway and culturing cells, the method comprising:

representing a network of chemical reactions of the at least one metabolic pathway as a symbolic model, the model comprising elements that include compounds comprising at least substrates and products, and reactant-product relationships between compounds;

determining a Boolean function from the symbolic model, wherein the Boolean

S/N 10/055,775  
Page 4 of 8

function returns a predetermined value if the network produces a set of target end-products;

evaluating the Boolean function to identify a first set of precursor substrates and/or reactant-product relationships that is sufficient to produce the set of target end-products and/or a second set of precursor substrates and/or reactant-product relationships that is insufficient to produce the set of target end-products; and

culturing cells in a medium selected based upon identification of at least one of the first and second sets to selectively support viability of the cells.

13. (Original) The method of claim 12 in which the model comprises at least 100 elements.

14. (Original) The method of claim 12 further comprising reducing the number of elements of the model.

15. (Original) The method of claim 12 in which the evaluating comprises finding one or more implicants and/or implicates of the Boolean function.

16. (Original) The method of claim 15 in which the evaluating comprises finding one or more prime implicants and/or prime implicates of the Boolean function.

17. (Original) The method of claim 16 in which the evaluating comprises finding any number up to and including all prime implicants and/or prime implicates of the Boolean function.

18. (Original) The method of claim 12 in which the evaluating comprises use of a binary decision diagram.

19. (Original) The method of claim 12 in which the evaluating comprises use of a branch-and-bound algorithm.

S/N 10/055,775  
Page 5 of 8

20. (Original) The method of claim 12 in which the evaluating comprises use of a fixed point method.

21. (Previously Presented) The method of claim 12 in which the model is transformed and the evaluating comprises evaluating a Boolean function determined from the model.

22. (Currently Amended) The method of claim 21 in which the evaluating identifies a set of relationships that is sufficient to produce the set of end-products ~~target compounds~~ or a set of relationships that is insufficient to produce the set of end-products ~~target compounds~~.

23-98. (Canceled)

99. (Currently Amended) A method for evaluating at least one metabolic pathway and culturing cells, the method comprising:

inferring a Boolean function from a chemical reaction network of the at least one metabolic pathway that includes relationships between compounds comprising at least substrates and products, the relationships representing chemical reactions between and the compounds including precursor substrates and ~~target~~ end-products,

wherein the Boolean function depends on variables, where each variable indicates a presence of at least one of the precursor substrates, and the Boolean function returns a predetermined value for every case in which at least one of the ~~target~~ end-products is formed from at least one of the precursor substrates;

evaluating the Boolean function to identify a first set of precursor substrates and/or relationships that is sufficient to produce a set of ~~target~~ end-products and/or a second set of precursor substrates and/or relationships that is insufficient to produce ~~the set of target~~ end-products; and

culturing cells in a medium selected based upon identification of at least one of the first and second sets to selectively support viability of the cells.

S/N 10/055,775  
Page 6 of 8

100. (Original) The method of claim 99 further comprising identifying a prime implicant or prime implicate of the Boolean function.

101. (Original) The method of claim 100 further comprising identifying any arbitrary number, up to and including all prime implicants or prime implicates of the Boolean function.

102. (Original) The method of claim 99 further comprising transforming the Boolean function into a binary decision diagram.

103. (Original) The method of claim 99 in which inferring comprises recursively constructing a symbolic representation of the Boolean function from the relationships.

104. (Original) The method of claim 103 in which the symbolic representation comprises nodes, each node corresponding to a variable.

105-111. (Canceled)